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ABSTRACT

This document investigates the interacting patterns of computer support and usage. Data were obtained from an inventory of computers in American higher education, 1967. The data indicated that the overall national picture masks the great variation among institutions of higher education. Four of the 21 findings were the following: (1) In fiscal year (FY) 1967 private institutions received a higher percentage of federal funds than public institutions in their region; (2) Private doctoral institutions in nine regions received significantly more federal funds in FY 1967 as compared to the national average; (3) There is considerable variation among regions in state support for public institutions' computer centers; and (4) Wide variations exist between regions and public and private institutions in the percentage of value of computer services in student course by academic area. (Author/MJM)

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Final Report "Interacting Patterns of Computer Support and Usage"

College of Notre Dame Grant No. GJ-977

Principal Investigator: Dr. June R. Chapin

Starting Date: June 15, 1970 Completion Date: June 15, 1971

Significant Findings

The overall national picture masks the great variation among institutions. Significant findings are first presented and keyed to the supporting data subsequently presented.

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1. Federal funds as a source of computer support have declined in all ten regions from FY 65 to FY 67. Region 9 (San Francisco)* received twice as high a percentage of federal funds than the national average.

2. In FY 65, private institutions in nine regions received more federal funds than public institutions in their region.

3. In FY 67, in eight of the ten regions, private institutions received a higher percentage of federal funds than public institutions in their region.

4. Private doctoral institutions in nine regions received significantly more federal funds in FY 67 as compared to the national average. But in seven regions, public doctoral institutions received less funds than the national average.

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*The classification is that used by the USOE. The breakdown of states into a region is found in Appendix A. For convenience, the office of the Region is given so that the reader has some idea of where the region is. For example, Seattle is the office of Region 10 which consists of four states: Alaska, Idaho, Oregon and Washington.

5. Even for public doctoral institutions receiving less federal funds than the national average, public doctoral institutions receive more federal funds than their region.

6. Two regions, Region 5 (Chicago) and Region 9 (San Francisco) account for 75% of all public and private doctoral institutions with 20,000 plus students. But there are impressive differences in many categories between the large size public doctoral institutions in these regions.

7. Only in exceptional cases do federal funds flow to non-doctoral institutions so that more than 20% of their source of support is provided by the federal government for their computer activities. Associate colleges, and especially private ones, are unlikely to secure high federal funds for their computer activities.

8. There is considerable variation among regions in state support for public institutions' computer centers. In five regions, low federal funds for public doctoral institutions were offset by state funds. But in two regions, low state funds are also associated with low federal funds for public doctoral institutions.

9. The highest percentage of state funds flow into various degree levels with five regions giving the highest percentage of their state funds to the Master's degree level.

10. Wide variation exist in regions and among public and private institutions as to the source of their federal funds. There are some exceptional striking high percentages going to both public and private institutions. See, for example, how NSF funds vary from region to region and what regions are depended highly upon NSF computer source.

11. In FY 67, institutions spent a higher percentage of their funds for equipment and staff as compared to FY 65. In public institutions, the highest percentage of money devoted to equipment was found at the associate and doctoral level. In contrast, private institutions had the highest percentage of equipment going to institutions offering a Master's degree.

12. In nine regions, public institutions spend a higher percentage of their funds on equipment than private institutions in their region.

13. Doctoral institutions, both public and private, have have a higher percentage of space devoted to office space than the national average. In contrast, associate colleges, usually have less office space than the national average.

14. Staff: public institutions have a higher percentage of operators than the national average on their staffs. Analysts are less likely to be found at the associate level for both public and private institutions.

15. The educational level of the staff appeared independent of other factors. There is a modest positive correlation of the number of doctorates compared to receiving high federal funds but the figure was not statistically significant.

16. Of the 9,539 courses requiring computer usage, approximately two-thirds of these courses are given by public institutions. Approximately 75% of the students taking a course that used a computer attended public institutions. However, private institutions in five regions reported a higher percentage of graduate students who were taking courses using a computer as compared to the national average.

17. Wide variations exist between regions and public and private institutions in the percentage of value of computer services in student course by academic area. Computer science as an academic subject is higher in seven public institutions' regions. Mathematics has a higher percentage in general in public institutions while psychology, physical sciences, social sciences appear above average in private institutions.

18. No significant relationships were found between instructional and research usage. However, Region 9, both public and private, had the highest number of computer usage hours.

19. Private institutions are significantly higher in the percentage of graduate students in their computer science programs in six regions. If a private institution has a computer science program, it is more likely to be on the graduate level.

20. No significant differences between regions or public and private institutions were regard to the mode of operation and software support operations were found. In fact, these two areas had the least amount of differences of all areas examined.

21. Institutional Administrative Applications: The most widely used include the following: producing probation lists, producing cumulative grade reports, producing term grade reports, producing class rosters, W-2 statements, vendor or remittance statements, hourly payroll, and mailing lists.

Sources of Support

1. Federal funds as a source of computer support have declined in all ten regions from FY 65 to FY 67. This trend is true for both public and private institutions of higher learning. However, Region 9 (San Francisco) only declined from 57% to 50%. Region 9 (San Francisco) is statistically different from the other regions by receiving more than twice as high a percentage of federal funds than the national average in FY 67.

Table 1 Comparison of Percentage of Federal Funds Received as Source of Support in FY 65 and FY 67

Regions	FY 65	FY 67
1 Boston	67%	28%
2 New York	49%	8%
3 Philadelphia	51%	23%
4 Atlanta	24%	10%
5 Chicago	36%	12%
6 Dallas	42%	21%
7 Kansas City	49%	8%
8 Denver	23%	16%
9 San Francisco	57%	50%
10 Seattle	28%	18%
National Average	46%	20%
Institutions Reporting	303	791

Sources of Support, FY 65

2. In an earlier period, FY 65, private institutions in nine regions received more federal funds than public institutions in their region. Region 10 (Seattle) was the only region in which public institutions received more federal funds than private institutions (29% to 11%). It should be noted that Region 10 appears to have comparatively few private institutions since there were only two private institutions in the sample from Region 10.

Table 2 Comparison of Percentage of Federal Funds Received by Public and Private Institutions, FY 65

Regions	Public	Private
1 Boston	40%	69% (18 institutions)
2 New York	25%	60%
3 Phila.	28%	63%
4 Atlanta	23%	31%
5 Chicago	35%	40%
6 Dallas	38%	54%
7 Kansas C.	46%	69% (6 institutions)
8 Denver	8%	49% (1 institution)
9 San Franc.	55%	61%
10 Seattle	29%	11% (2 institutions)
National Aver.	46%	
Institutions in the sample	175	128 private institutions

Sources of Support, FY 67

3. In FY 67, in eight of the ten regions, private institutions received a higher percentage of federal funds than public institutions in their region. In Region 10 (Seattle), public institutions continued to receive more federal funds than private institutions. In Region 7 (Kansas City), public institutions also received slighly more funds (8% to 7%) but this slight difference is not significant. Note, as in Region 9, it is possible for a region to have high federal funds for both public and private institutions.

Table 3 Comparison of Percentage of Federal Funds Received by Public and Private Institutions, FY 67

Regions	Public	Private
1 Boston	4%	37% (48 institutions)
2 New York	5%	16%
3 Phila.	17%	25%
4 Atlanta	9%	16%
5 Chicago	9%	17%
6 Dallas	6%	76% (9 institutions)
7 Kansas C.	8%	7% (23 institutions)
8 Denver	5%	39% (6 institutions)
9 San Franc.	40%	66%
10 Seattle	21%	0% (5 institutions)
No. of institutions	453	338

Source of Support, Private Doctoral Institutions

4. Private doctoral institutions in nine regions received more federal funds in FY 67 for computer support as compared to the national average (statistically significant at .01 level). In contrast, public doctoral institutions in only three regions (Region 3-Philadelphia with 58%; Region 9-San Francisco with 55% and Region 10-Seattle with 34%) received statistically significant high proportions of federal funds as compared to the national average. In other words, all doctoral institutions in all regions do not automatically receive high federal funds as a source of support. Indeed, there were seven regions in which public doctoral institutions received less funds than the national average.

Table 4 Comparison of Percentage of Federal Funds Received by Public and Private Doctoral Institutions, FY 67

Regions	Public Doct.	Private Doct.	Count of Private Institutions
1 Boston	7%	43%	(34)
2 New York	7%	45%	(20)
3 Phila.	58%	39%	(34)
4 Atlanta	13%	37%	(13)
5 Chicago	14%	26%	(7)
6 Dallas	3%	87%	(4)
7 Kansas C.	12%	34%	(5)
8 Denver	6%	46%	(2)*
9 San Franc.	55%	67%	(27)
10 Seattle	34%	0%	(1)
No. of insti.	204	147	

*Note that there are only a few private doctoral institutions in some regions.

Source of Support, Public Doctoral Institutions

5. Even for public doctoral institutions receiving less federal funds for support than the national average, public doctoral institutions in nine regions received more federal funds than their region considered as a whole.

Most interesting is Region 3 (Phila.) which in FY 65 had public doctoral institutions (size of sample 17) receiving 25% support from the federal funds but now received in FY 67 58% of its support from the federal government (12 institutions reporting data). This indeed is bucking the national trend.

Note also that there appears to be little correlation between the number of public doctoral institutions per se in a region and the amount of federal support.

Table 5 Comparison of the Percentage of Federal Funds Received by the Region as a whole and by Public Doctoral Institutions in FY 67

Regions	Region as a Whole	Public Doct. Insti.
1 Boston	4%	7% (9 institutions)
2 New York	5%	7% (13 institutions)
3 Phila.	17%	58% (12 institutions)
4 Atlanta	9%	13% (44 institutions)
5 Chicago	9%	14% (40 institutions)
6 Dallas	6%	3% (17 institutions)
7 Kansas C.	8%	12% (22 institutions)
8 Denver	5%	6% (9 institutions)
9 San Franc	40%	55% (33 institutions)
10 Seattle	21%	34% (5 institutions)

Large-Size Doctoral Institutions

6. A further complexity in analyzing the impact of the doctoral institutions is that approximately 75% of all public and private doctoral institutions with 20,000 plus students are located within two geographical regions: Region 5 (Ill., Ind., Minn., Mich., Ohio, Wis.) and Region 9 (Calif., Ariz., Hawaii, Nev.).

Region 5's public doctoral institutions with 20,000 plus students and Region 9's public doctoral institutions with 20,000 plus students are significantly statistically different from each other in the following ways. Yet both spend approximately the same amount for computers.

Table 6 Differences between Public Doctoral Institutions with 20,000 plus Students in Regions 5 and 9, FY 67

Category	Region 5 Pub. Doct.	Region 9 Pub. Doct.	
Fed.Support	19%	53%*	(23 institutions)
Fed.Funds by Source			
NSF	57%	50%	
NIH	7%	13%	
AEC	14%	4%	
NASA	0%	7%	(22 institutions)
ONR	5%	0%	
ARPA	2%	21%	
Other	14%	4%	
Staff,Full-time Equivalent Analyst	11%	1%	(24 institutions)

*Significant at .01 level; every figure on this page with the exception of Region 5's federal support is significant statistically from national figures.

Further Comparisons of Large-Size Doctoral Institutions

Yet a different picture of the regions' public doctoral institutions appears when one looks at the data on student computer use.

Table 6A Differences in Student Use in Course Work between Public Doctoral Institutions in Regions 5 and 9

Category	Region 5 Pub. Doct.	Region 9 Pub. Doct.
Number of Courses	995	347
No. of Students Using Computer Install,Und.	27,100 (78%)	6,854 (74%)
Graduate Stud.	7,640 (22%)	2,375 (26%)
Value of Comp.Service Student Usage		
Undergraduate	$726,000 (41%)	$326,000 (59%)
Graduate	1,025,000 (59%)	228,000 (41%)
Total	$1,751,000	$554,000
Comp. Science Degree Programs		
Total Students	698*	576*
Undergraduate	69%*	55%*
Graduate	31%*	45%*
Value of Comp.Service in Stud. Course Work by Acad. Area		
Engineering	26%*	61%*
Mathematics	1%*	10%*
Business	15%*	8%*
Physical Sciences	14%*	5%
Computer Science	23%	3%*
Hours of Comp. Usage		
Research	59%*	52%*
Administration	21%*	20%*
Instruction	19%*	24%*

*Significant at .01 level from the national average

Summary of Differences between the Public Large-Size Doctoral Institutions, FY 67

Public doctoral institutions (20,000) plus students) in Region 9 are depended upon federal funds for computer support far more than Region 5's public doctoral institutions of an equivalent size (53% vs 19%). Both regions on this level receive approximately half of their federal funds from NSF but the distribution of other federal funds is different between the two regions.

But Region 5 has a higher percentage of analysts on their staff. In addition, Region 5's large-size public doctoral institutions report about three times as many computer courses, students using computers in course work, and value of computer service for student use. This is also indicated by the high percentage of computer science in student course work by academic area.

However, the difference of the number of students in computer science education is not vastly different between the two regions. In fact, Region 9 has a higher percentage of graduate students in computer science which one would believe would increase student computer usage. But public institutions in Region 9 at this level report only 3% of their total value going to computer science education. In contrast, Region

9's public large-size doctoral institutions report a very, very high student usage in engineering (61%) and in mathematics (10%).

Data from the mode of operation and software support operations indicate that there are no significant differences in these two categories between the two regions. This means that equipment is probably not causing the differences.

In effect, doctoral institutions have an impact on the national data. But the effect of the large-size doctoral institutions appears to be different in different regions.

Federal Funds to Non-Doctoral Institutions

7. Federal funds do not normally flow into educational institutions that do not grant a doctor's degree. The following are the only exceptions where a given region with non-doctoral institutions received federal funds at or above the national average, 20% in FY 67.

Regions	Level	Fed. Funds	No of Insti.
Public Institutions			
6 Dallas	Assoc.	42%	3
9 San Fran.	Bach.	20%	2
10 Seattle	Master's	39%	1
Private Institutions			
2 New York	Assoc.	32%	3
5 Chicago	Master's	23%	25
8 Denver	Master's	23%	4

In other words, high federal funds to other than doctoral granting institutions appear to be an exception. The only example of a large number of institutions in a given region receiving high federal funds for computer support are the private institutions at the M.A. level in Region 5.

This point is further illustrated by the following table of federal funds to associate level colleges. Note that private institutions on the associate level have no advantage in securing federal funds as a source of computer support.

Table 7 Comparison of Federal Funds Received by Public and Private Colleges at the Associate Level, FY 67

Regions	Public	Private
1 Boston	1%	0% (1 institution)
2 New York	8% (25)	32% (3 institutions)
3 Philadelphia	1%	0% (3 institutions)
4 Atlanta	4%	0% (2 institutions)
5 Chicago	2%	3% (2 institutions)
6 Dallas	42% (2)	0% (1 institution)
7 Kansas City	2%	0% (1 institution)
8 Denver	13% (4)	0% (none)
9 San Franc.	10% (24)	0% (none)
10 Seattle	0% (5)	0% (5 institutions)

State Funds

8. State funds as a separate category were not identified in FY 65 data. However, in FY 67 in five regions where federal funds for public doctoral institutions were below the national average, state funds were higher than federal funds. In other words, state funds did help to offset the relatively low federal funds. However, in two regions, low federal funds were also associated with low state funds for public doctoral institutions. Note the wide variation in state funds among the different regions.

Table 8 Comparison of Federal Funds and State Funds Received by Public Doctoral Institutions

Regions	Fed. Funds Received	State Funds
1 Boston	7%	3%
2 New York	7%	26%
3 Philadelphia	58%	0%
4 Atlanta	13%	21%
5 Chicago	14%	22%
6 Dallas	3%	2%
7 Kansas City	12%	18%
8 Denver	6%	19%
9 San Francisco	55%	2%
10 Seattle	34%	17%
	Nat.Aver.	11%

State Funds Go to Various Degree Levels

9. There is a wide variation among different levels in receiving state funds. Five regions gave the highest percentage of state funds to the master's level: Region 2 (45%), Region 4 (24%), Region 5 (23%), Region 8 (44%), and Region 9 (35%). On the Bachelor's level, three regions gave the highest percentage of their state funds to this level: Region 6 (55%), Region 3 (20%), and Region 10 (21%). In only two regions (Region 1 with 45% and Region 7 with 27%) does the highest amount of state funds go to the associate level. In no region did the highest percentage of state funds go to public doctoral level institutions.

Table 9 Distribution of State Funds to Public Institutions by Highest Level of Degree Given

Regions	Level 4 Doct.	Level 3 Master's	Level 2 Bachelor	Level 1 Assoc.	Aver.
1 Boston	3%	15%	0%	45%	22%
2 New York	26%	45%	0%	21%	30%
3 Phila.	0%	0%	20%	10%	8%
4 Atlanta	21%	24%	6%	21%	20%
5 Chicago	22%	23%	0%	9%	19%
6 Dallas	2%	1%	55%	8%	5%
7 Kansas C.	18%	18%	0%	27%	19%
8 Denver	19%	44%	0%	21%	14%
9 San Fr.	2%	35%	0%	12%	7%
10 Seattle	17%	17%	21%	0%	18%

Federal Funds by Source-Wide Variation

10. Significant statistical differences are found both among regions and between public and private institutions with regard to the source of their federal funds. For example, NSF funds are significantly above average as a source of support for the following three regions: Region 5-Chicago with 50%; Region 7-Kansas City with 58% and Region 10-Seattle with 57%. Significantly high funds as a source of support occurred for 13 public doctoral institutions, seven private doctoral institutions, 4 private Master's degree institutions, and 3 Bachelor degree institutions on the private level(data not shown).

Exceptional cases are the high percentage of NASA funds (45%) to public institutions in Region 1 (Boston), NIH funds to public institutions in Region 4 (Atlanta with 25%) and Region 7 (Kansas City with 25%). Many private institutions in two regions are also depended upon NIH funds: Region 3 (Philadelphia with 34% and Region 4 (Atlanta with 73%). AEC funds are important to public instituions in Region 5 (Chicago-12%) and Region 7 (Kansas City with 24% while private institutions in Region 2 (New York) are depended also upon AEC in the amount of 24% in FY 67. AERA funds are important to both public and private institutions in Region 9 (San Francisco) in the amounts of 15% and 27%.

Table 10 Federal Funds by Source, FY 67

Regions	NSF	NIH	AEC	NASA	OE	ONR	ARPA	Oth.
1 Boston	28%	14%	9%	3%	9%	3%	1%	34%
2 New Yk.	23%	11%	12%	0%	40%*	2%	3%	7%
3 Phila.	9%	21%	1%	3%	1%	26%*	3%	34%
4 Atlanta	10%	42%*	1%	9%*	4%	1%	0%	33%
5 Chicago	50%*	8%	8%	3%	1%	16%	2%	12%
6 Dallas	15%	14%	0%	0%	0%	0%	0%	71%
7 Kansas	58%*	15%	12%	3%	2%	0%	1%	9%
8 Denver	31%	0%	0%	2%	7%	0%	0%	60%
9 San Fr.	20%	20%	12%	6%	7%	4%	21%*	9%
10 Seattle	57%*	7%	5%	4%	1%	5%	0%	21%
Nat. Aver.	24%	18%	8%	4%	7%	7%	9%	23%

Table 10A Comparison of Federal Funds by Source, Only NSF Funds for Public and Private Institutions, FY 67

Regions	Public	Private
1 Boston	15%	28%
2 New York	14%	32%*
3 Phila.	4%	12%
4 Atlanta	14%	3% (39 insti.)
5 Chicago	63%*	26%
6 Dallas	55%*	0%
7 Kansas C.	23%	87%* (7 insti.)
8 Denver	30%	32%*
9 San Fran.	29%	12%
10 Seattle	57%*	100%* (5 insti.)

*Significant at .01 level; to avoid confusion not all of the significant differences are marked.

Table 10B The Two Highest Sources of Federal Funds for Each Region, FY 67

Public Institutions

Regions	Agencies
1 Boston	NASA (45%); Other (20%)
2 New York	OE (80%); NSF (14%)
3 Philadel.	Other (79%); ARPA (8%)
4 Atlanta	Other (40%); NIH (25%)
5 Chicago	NSF (63%); Other (13%)
6 Dallas	NSF (55%); Other (32%)
7 Kansas C.	NIH (25%); AEC (24%)
8 Denver	Other (43%); NSF (30%)
9 San Fran.	NSF (29%); ARPA (15%)
10 Seattle	NSF (57%); Other (21%)

Private Institutions

1 Boston	Other (35%); NSF (28%)
2 New York	NSF (32%); AEC (24%)
3 Philadel.	ONR (42%); NIH (34%)
4 Atlanta	NIH (73%); Other (20%)
5 Chicago	ONR (38%); NSF (26%)
6 Dallas	Other (85%); NIH (15%)
7 Kansas C.	NSF (87%); OE (3%)
8 Denver	Other (68%); NSF (32%)
9 San Fran.	ARPA (27%); NIH (21%)
10 Seattle	NSF (100%)

Expenditures

11. In FY 67, institutions of higher learning spent a higher percentage of their funds for equipment (28% compared to FY 65's 16%) and more money was devoted to staff (39% compared to FY 65's 30%). The high percentage of funds, 49% going to the ambiguous category "Other" has been reduced as more money is now spent in the categories, equipment and staff.

    Thus, there appears to be a continual building up of equipment and staff. However, there is extreme variability within a region and especially at the different degree levels. However, considering the public institutions as a whole, in five regions the highest proportion of expenditures for equipment were on the associate level and in four regions the highest expenditures were on the doctoral level. In private institutions, institutions offering Masters show the highest percentage devoted to equipment (data not shown).

Table 11 Comparison of Expenditures of All Institutions by Regions in FY 65 and FY 67

	FY 65					FY 67				
Regions	Equip.	Build.	Furn.	Sta.	Oth.	Equip.	Build.	Furn.	Sta.	Oth.
1 Boston	10%	5%	1%	28%	56%	17%	7%	0%	35%	40%
2 New York	7%	1%	0%	31%	60%	34%	6%	1%	35%	24%
3 Phila.	21%	7%	2%	25%	44%	28%	4%	1%	41%	27%
4 Atlanta	21%	2%	1%	33%	44%	30%	3%	1%	40%	27%
5 Chicago	22%	7%	1%	29%	41%	26%	2%	1%	44%	28%
6 Dallas	23%	3%	1%	26%	46%	33%	7%	1%	35%	24%
7 Kansas	8%	0%	1%	35%	55%	36%	1%	1%	42%	20%
8 Denver	40%	0%	2%	23%	35%	38%	0%	1%	36%	25%
9 S. F.	10%	2%	1%	35%	52%	29%	3%	1%	37%	30%
10 Seattle	3%	1%	1%	32%	64%	25%	15%	2%	32%	26%
Nat. Aver.	16%	4%	1%	30%	49%	28%	4%	1%	39%	28%

Comparison of Expenditures for Public and Private Institutions

12. In nine regions, public institutions spend a higher percentage of their funds on equipment than private institutions in their region. Thus, in six regions, public institutions spend a higher percentage of their funds on equipment than the national average while only private institutions in two regions are above average in the percentage spent for equipment. Wide variations exist on the percentage of money spent on staff between the regions and also between public and private institutions.

Table 12 Comparison of Expenditures for Public and Private Institutions for FY 67

	Public					Private				
Regions	Equip.	Build.	Furn.	Staf.	Oth.	Equip.	Build.	Furn.	Staff.	Oth.
1 Boston	18%	6%	1%	44%	31%	17%	7%	0%	34%	42%
2 New Yk.	37%	3%	1%	39%	20%	32%	8%	1%	32%	27%
3 Phila.	35%	2%	1%	34%	27%	21%	5%	0%	47%	26%
4 Atlanta	29%	3%	1%	40%	27%	32%	2%	1%	38%	27%
5 Chicago	27%	1%	1%	46%	25%	24%	3%	1%	38%	34%
6 Dallas	37%	8%	2%	34%	19%	11%	0%	0%	38%	50%
7 Kansas	40%	1%	1%	41%	17%	21%	2%	1%	44%	32%
8 Denver	40%	0%	1%	35%	25%	30%	0%	0%	44%	26%
9 S. F.	31%	4%	1%	37%	27%	27%	2%	0%	36%	36%
10 Seattle	26%	16%	2%	32%	25%	2%	0%	1%	47%	49%
Nat. Av.	28%	4%	1%	39%	28%					

Amount of Space Devoted to Office Space

13. From the analysis of the amount of space devoted to machinery, office space, and storage, wide variations exist between regions and between public and private institutions within a region. However, doctoral institutions, both public and private at a .01 significant level, have a higher percentage of their space given to to office than the national average. In contrast, at the associate level, less than 1% of all public junior colleges and only 9% of the private junior colleges are likely to have more office space than the national average (data not shown).

Table 13 Comparison of Floor Space between Public and Private Institutions, FY 67

	Public			Private		
Regions	Mach.	Off.	Stor.	Mach.	Off.	Stor.
1 Boston	38%	51%	18%	43%	37%	8%
2 New Yk.	57%	31%	12%	50%	41%	9%
3 Phila.	34%	51%	9%	41%	44%	8%
4 Atlan.	58%	36%	12%	55%	32%	13%
5 Chica.	47%	40%	11%	49%	34%	9%
6 Dallas	53%	37%	10%	49%	42%	8%
7 Kansas	36%	49%	10%	51%	40%	9%
8 Denver	54%	33%	12%	47%	27%	26%
9 San Fr	52%	37%	9%	48%	45%	7%
10 Seatt.	39%	30%	16%	73%	16%	11%
Nat.Aver.	48%	40%	11%			

Staff Positions

14. One of the interesting differences between public and private institutions on staffing is that in nine regions public institutions have a higher percentage of operators than the national average on their staffs. This is probably related to the fact that public institutions have a higher number of peripheral units (948) compared to the private institutions (707).

Analysts are significantly less likely to be found at the associate level (.01 level of significance) for both public and private institutions. However, the data did not support the hypothesis that doctoral level institutions as a whole or either as separate units were more likely to have a higher percentage of analysts on their staff although this appeared to be the trend. There is no other clear pattern for other staff positions except that Region 9 has the highest percentage of programmers (30% for public institutions and 34% for private institutions).

Staff by Educational Level, FY 67

15. The educational level of the staff appeared independent of other factors. For example, Region 10 has the highest educational level of staff in terms of percentage of staff with three years above college or better (public-74%) and private (85%). Yet this was not related to the fact that the public institutions had received federal funds while the private institutions did not. There was a modest positive correlation of the number of doctorates compared to receiving high federal funds but the figure was not statistically significant.

Table 15 Staff by Educational Level, FY 67

Regions	Do.	Ma.	Pr.	Ba.	U.G.	As.	H.S	St.	Oth.*
1 Boston	3%	10%	0%	21%	20%	3%	40%	2%	0%
2 New Yk.	4%	8%	0%	17%	29%	4%	35%	1%	1%
3 Phila.	5%	7%	0%	19%	22%	4%	40%	1%	1%
4 Atlan.	4%	9%	0%	19%	27%	5%	35%	1%	1%
5 Chica.	2%	9%	0%	18%	23%	6%	39%	1%	1%
6 Dallas	3%	8%	0%	18%	38%	2%	26%	3%	1%
7 Kansas	3%	7%	1%	18%	33%	4%	33%	1%	1%
8 Denver	4%	7%	0%	28%	27%	3%	30%	0%	1%
9 San Fr.	5%	7%	0%	22%	24%	7%	30%	2%	3%
10 Seattle	7%	10%	0%	19%	39%	10%	13%	0%	1%
Nat. Aver.	4%	8%	0%	19%	26%	5%	35%	1%	1%

Student Use of Computers in Course Work, FY 67

16. Of the 9,539 courses requiring computer usage, approximately two-thirds of these courses were given by public institutions. In only three regions (1, 2, 3) did private institutions exceed public institutions in the number of courses requiring computer usage. Approximately 75% of the students taking a course that used a computer attended public institutions. However, private institutions in five regions reported a higher percentage of graduate students who were taking courses using a computer as compared to the national average. Only public institutions in three regions reported a higher percentage of graduate students who used a computer with a course. In a similar manner, private institutions in six regions reported a higher percentage of the value of computer services to graduate students (above the national average) while only public in only one region (Region 5-Chicago) reported that the value of computer services to graduate students was above average(not all data shown).

Table 16 Comparison of Public and Private Institutions on the Number of Courses and Percentage of Undergraduate/Grad. Students

Regions	Public			Private		
	Courses	Under. Students	Gra.	Courses	Under. Students	Grad.
1 Boston	267	90%	10%	660	66%	34%
2 New York	432	93%	7%	756	75%	25%
3 Phila.	478	78%	22%	627	85%	15%
4 Atlanta	1,022	87%	13%	235	80%	20%
5 Chicago	1,443	81%	19%	473	88%	12%
6 Dallas	581	87%	13%	52	79%	21%
7 Kansas C.	634	76%	24%	117	91%	9%
8 Denver	245	87%	13%	41	86%	14%
9 San Fran.	1,081	90%	10%	174	53%	47%
10 Seattle	192	90%	10%	29	96%	4%
Nat. Aver.		83%	17%			
Total-Course	6,375			3,164		

Differences in Academic Area Usage, FY 67

17 Wide variation in computer usage by academic area were noted both in different regions and between public and private institutions. Note that the data is given in percentage of value of computer services in student course by academic area. In addition, we should also recall Hamblen's concern about the reliability of these data.

Engineering

	Regions	Public	Private	
	1 Boston	23%	18%	
	2 New York	12%	29%	
	3 Phila.	22%	41%	(highest single acad.area)
	4 Atlanta	30%	22%	
	5 Chicago	19%	28%	
	6 Dallas	31%	3%	
(high)	7 Kansas C.	37%	16%	
	8 Denver	38%	38%	(highest single acad.area)
	9 San Francis.	29%	14%	
	10 Seattle	27%	26%	
	National Average	26%		

Computer Science

(high)	1 Boston	62%	13%	
(high)	2 New York	34%	13%	
(high)	3 Phila.	43%	14%	
	4 Atlanta	19%	17%	
(high)	5 Chicago	30%	20%	
	6 Dallas	8%	64%	(highest single acad.area)
	7 Kansas City	17%	8%	
	8 Denver	9%	11%	
	9 San Francisco	9%	50%	(highest single acad.area)
	10 Seattle	24%	48%	(highest single acad.area)
	National Average	24%		

Note that computer science is higher in the seven public institutions' regions but in three regions (6,9,10) private institutions' computer science is significantly high.

Differences in Academic Area Usage-Cont.

Business

	Regions	Public	Private
	1 Boston	4%	37% (highest single acad.area)
	2 New York	10%	16%
	3 Philadel.	7%	11%
	4 Atlanta	15%	10%
	5 Chicago	17%	10%
(high)	6 Dallas	37%	6%
	7 Kansas	18%	20%
	8 Denver	12%	4%
	9 San Fran.	27%	9%
	10 Seattle	15%	13%

National Aver. 17%

Mathematics

Regions	Public	Private
1	4%	6%
2	18%	15%
3	15%	11%
4	21%	11%
5	10%	17%
6	13%	17%
7	16%	5%
8	28%	4%
9	10%	5%
10	25%	4%

Nat.Aver. 13%

Note: Public above aver. in 7 regions

Psychology

Public	Private
1%	2%
2%	3%
1%	4%
1%	3%
2%	2%
1%	0%
0%	12%
2%	31%
3%	4%
0%	4%

Nat.Av. 2%

Note: 8 Regions private above average

Physical Sciences

Public	Private
1%	7%
2%	16%
9%	8%
3%	5%
10%	17%
2%	8%
8%	26%
0%	7%
7%	5%
2%	4%

Nat.Av. 7%

Note: 8 regions private above average

Social Sciences

Reg.	Public	Private	Reg.	Public	Private
1	0%	8%	6	0%	3%
2	5%	2%	7	2%	10%
3	1%	3%	8	1%	2%
4	2%	5%	9	7%	3%
5	4%	5%	10	0%	0%

Nat. Aver. 3% Note that in seven regions private institutions are above public institutions.

Differences in Academic Area Usage

Analyzing the value of computer services in student course by academic area, some tentative conclusions could be made about differences in different levels. For example, public associate colleges (junior colleges) were significantly more likely to have above average usage in the academic area, computer science. However, in private institutions on the associate level, no regions were above average in value of computer services in the academic area, computer science. There was no difference on the doctoral level in the academic area, business. Mathematics appeared to be more likely to be above average in public doctoral institutions rather than private institutions. Biology was especially high in Region 4 (Atlanta) on the doctoral level (private) (institutions size 10,000-19,999) with 46% of computer value of student courses in this area; there were seven doctoral institutions in this particular category.

Computer Usage Hours

18 Although three separate programs were used to explore the relationships between instructional and research usage, no significant relationships were found among the following data:

1. modest positive correlation of .26 between federal funds and sponsored research but not significant;
2. the relationship between a large number of hours of computer time is not correlated significantly with high research usage;
3. the number of computers is not significantly related to high research usage;
4. private doctoral colleges are more likely to have a higher rate of research than public doctoral institutions-a trend but not significant.

Table 18 Comparison of Public and Private Institutions in Computer Usage Hours, FY 67

	Public				Private			
Regions	Res.	Adm.	Inst.	Total Hours	Res.	Adm.	Inst.	Total Hours
1 Boston	29%	23%	48%	4,305	44%	19%	27%	13,414
2 New Yk.	30%	30%	37%	13,622	47%	25%	25%	13,696
3 Phila.	37%	25%	36%	15,320	42%	28%	23%	17,102
4 Atlan.	35%	31%	30%	26,451	35%	26%	35%	5,757
5 Chicago	43%	29%	27%	40,701	22%	27%	37%	13,382
6 Dallas	28%	26%	43%	11,809	28%	21%	28%	850
7 Kansas	38%	36%	25%	9,540	32%	33%	35%	3,787
8 Denver	22%	29%	35%	4,774	27%	45%	27%	440
9 San Fr.	34%	23%	40%	25,608	66%	7%	20%	20,202
10 Seattle	35%	26%	35%	2,691	5%	24%	43%	758

Computer Science Education

19 Private institutions are significantly higher in the number of graduate students in their computer science programs in six regions. If a private institution has a computer science program, it is more likely to be on the graduate level. In contrast, only Region 3 (Phila.) for public institutions has a high percentage of graduate students in computer science education. The ratios of staff to students is almost unbelievable in a few regions (1:88; 1:70; etc.) and appears not to be related to any other data (data not shown).

Table 19 Comparison of Public and Private Institutions' Computer Science Programs, FY 67

Regions	Public Under.	Public Grad.	Private Under.	Private Grad.	
1 Boston	62%	38%	51%	49%	
2 New York	74%	26%	36%	64%	
3 Phila.	37%	63%	9%	91%	
4 Atlanta	88%	12%	83%	17%	
5 Chicago	88%	12%	66%	34%	
6 Dallas	90%	10%	0%	0%	(no institutions)
7 Kansas C.	88%	12%	0%	100%	(1 institution)
8 Denver	98%	2%	0%	0%	(no institution)
9 San Fran.	91%	9%	0%	100%	
10 Seattle	100%	0%	0%	0%	(no institution)
National Aver.	81%	19%			

Mode of Operation and Software Support

20 There appear to be no significant differences between regions or public and private institutions with regard to the mode of operation and software support operation. In fact, these two areas had the least amount of differences of all areas examined.

Mode of Operation, Total for All Schools, FY 67

	Conver	Batch	M-Press	M-Prog	M-Task	Count of Inst.
Nat.Av.	14%	65%	4%	10%	7%	643 institutions
Public Doct.	13%	59%	5%	12%	10%	138 institutions
Private Doct.	21%	57%	5%	10%	6%	46 institutions

Software Support Utilization, Total for All Schools, FY 67

	OP-SYS	FORTRAN	COBOL	ALGOL	PL/1	Other	Count of Insti.
Nat.Aver.	28%	27%	13%	5%	5%	22%	643 insti.
Public Doct	30%	23%	14%	7%	5%	21%	138 insti.
Private Doct	33%	23%	14%	7%	6%	17%	46 insti.

Institutional Administrative Applications

FREQUENCIES OF FORM 5 ADMINISTRATIVE APPLICATIONS, TOTAL FOR ALL SCHOOLS
INSTITUTIONAL RESEARCH, PLANNING, AND DEVELOPMENT

29	30	31	32	33	34	35	36	37	38	39	40	41	42	Card
1	11	134	149	273	107	23	31	128	71	197	83	114	91	Numbe
0	1	15	17	31	12	3	3	14	8	22	9	13	10	% of

PAYROLL AND ACCOUNTING

55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	7
321	78	93	113	340	228	304	243	59	53	113	319	147	107	72	27
36	9	10	13	38	26	34	27	7	6	13	36	16	19	8	3

MEDICAL APPLICATIONS				*LIBRARY AUTOMATION*							*TOTAL COUNT*
20	21	22	23	33	34	35	36	37	38	39	
3	13	29	17	1	5	9	34	13	17	46	894
0	1	3	2	0	1	1	4	1	2	5	100

ADMISSIONS, RECORDS, STUDENT AFFAIRS, AND ALUMNI

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	7
23	124	148	34	150	64	206	301	328	221	434	466	421	62	277	4
3	14	17	4	17	7	23	34	37	25	49	52	47	7	31	

dministrative Applications

APPLICATIONS, TOTAL FOR ALL SCHOOLS
ND DEVELOPMENT

36	37	38	39	40	41	42	Card Col. Identification
31	128	71	197	83	114	91	Number of Schools
3	14	8	22	9	13	10	% of Total Schools

62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
243	59	53	113	319	147	167	72	276	263	140	55	126	197	148	162	187
27	7	6	13	36	16	19	8	31	29	16	6	14	22	17	18	21

CHALIFATION *TOTAL COUNT*

35	36	37	38	39
9	34	13	17	46
1	4	1	2	5

894
100

, AND ALUMNI

64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
301	328	221	434	466	421	62	277	45	88	148	129	95	156	74
34	37	25	49	52	47	7	31	5	10	17	14	11	17	8

Appendix B Limitations to Data Analysis

All limitations mentioned in John Hamblen's excellent report, Inventory of Computers in U. S. Higher Education, apply to this report. The raw data analyzed here were provided by Dr. Hamblen and covered schools in states from Alabama to Texas. Some disagreement with Dr. Hamblen's summary data can be noted. Some of this arises because in this report no attempt was made to extrapolate ratios or to figure overhead on any of the financial figures. The count of the number of institutions in various categories was used instead.

In summary, the data from Dr. Hamblen's FY 67 report is magnificant compared to what was gathered in FY 65. Most meaningful is the consideration of size at the various degree levels. Hamblen's work certainly should be continued because of the usefulness of the data he collects.

James R Chapin 6-25-71